ANNUAL REPORT 1964

GODERICH

water treatment plant

DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Goderich Local Advisory Committee,
Town of Goderich.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Goderich Water Treatment Plant, OWRC Project No. 60-W-69.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water supply.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Goderich Water Treatment Plant, OWRC Project No. 60-W-69 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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GODERICH

water treatment plant

operated for

THE TOWN OF GODERICH

by

THE ONTARIO WATER RESOURCES COMMISSION

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Assistant Director: **C. W. Perry**
Regional Supervisor: **D. A. McTavish**
Operations Engineer: **B. G. Porter**

801 Bay Street **Toronto 5**

'64 REVIEW

This report gives in detail significant data on the operation of various treatment units of the Goderich Water Treatment Plant.

The average daily flow of 0.805 million gallons was less than the average daily flow in 1963 of 0.835 million gallons by 3.6 percent. This decrease in average demand was probably due to the lawn watering restrictions which began during the summer of 1964. In addition, the restrictions aided in reducing peak demand. Both average and peak demands would undoubtedly be reduced further if water meters were installed.

On July 23, 1964, a bypass from the raw water well to the treated water well was installed. This bypass was installed to ensure that an adequate volume of water would be available during emergency conditions when the demand exceeded the filter design capacity. The bypass was not used during 1964.

TREATED WATER QUALITY

The treated water quality was excellent throughout the year and met OWRC standards at all times.

RAW WATER QUALITY

The quality of the raw water was generally good. However, due to a water with higher turbidity, more alum had to be used than in the previous year. Filter plugging algae and heavy water weeds made operation difficult during certain periods, especially during the summer months.

COST

The operating costs were in proportion to the type and capacity of the plant.

PLANT

The staff maintained a clean, attractive and efficient plant for the Town of Goderich, special attention was given to good public relations and many visitors, particularly of school age, visited the plant during the year.

GLOSSARY

BTU	British Thermal Unit
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpm	gallons per minute
lin. ft.	linear feet
mgd	million gallons per day
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY
1960 – 1964

INCEPTION

In 1960, the Town of Goderich and the Ontario Water Resources Commission initiated plans for the construction of a modern water treatment plant.

The firm of James F. MacLaren Limited, Toronto, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

In May 1960, the town signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

In early 1962, Bedford Construction Limited, began construction and by November 16, 1962, the Division of Plant Operations took over the operation.

TOTAL COST

$1,010,714.26.

Project Staff

M. Wilkinson
Chief Operator

Assistant Chief Operator:	M. McKee
Operators:	M. McAdam
	G. Nelson
	M. Sheardown

COMMENTS

Mr. D. McPhail resigned on January 30, 1964, and was replaced by Mr. M. Sheardown on April 8, 1964. Mr. M. McKee was promoted to Assistant Chief Operator on December 1, 1964.

The plant operators were on a twenty-four hour, seven day a week schedule throughout the year. The Chief Operator was normally in attendance at the plant during the week from 8 a.m. to 5 p.m. The shift schedule was based on a forty-two hour work week until November 7, when the work week was adjusted to forty hours on a trial basis.

Mr. G. Nelson was presented with the American Water Works Association award for 25 years of continuous service in the water works field on August 24, 1964.

DESCRIPTION

INTAKE

The intake works consist of a rock-filled timber crib with cover plate and 1,606 feet of 30 inch diameter intake main. At the crib, the water depth ranges from 16.16 feet to 22.36 feet between minimum and maximum lake levels. Raw water is fed to the screen chamber or can be by-passed directly to the low lift pumping well.

SCREENING

Water is screened through a Link Belt type Model No. 45A Thruflow, travelling water screen with clear openings of 3/8 inch. The screen is normally operated manually but is fitted for automatic starting at 2 inch W. G. differential and to sound an alarm at 4 inch W. G. differential.

LOW LIFT PUMPING

The low lift pumping well is divided into two compartments. The larger compartment has a volume of 1,880 cubic feet and can act for two low lift pumps. One pump is rated at 1.25 MGD at 28 feet T. D. H. and the other is rated at the same head. The second compartment has a volume of 800 cubic feet. Water is pumped from this compartment by a pump rated at 1.25 MGD at 28 feet T. D. H.

All pumps are vertical, turbine type, centrifugal, electric driven pumps (Layne & Bowler). A diesel generator set is used to supply electricity throughout the entire plant in event of electric failure.

Low lift pump delivery is directly to the flash mixing chamber. A Venturi meter is inserted into this line for recording flow.

FLASH MIXING CHAMBER

Liquid or dry chemicals such as alum are mixed with raw water in the flash mixing chamber. It has a volume of 500 cubic feet which provides a detention period of 6.0 minutes at 0.75 MGD, 3.6 minutes at 1.25 MGD and 2.75 minutes at 2.0 MGD. One flash mixer unit (Link Belt No. 30) is installed in the flash mixing chamber. Water flows by gravity from the flash mixing chamber through a flume to the flocculating tanks.

FLOCCULATING TANKS

There are two flocculating tanks. Each tank has a volume of 4760 cubic feet. They provide a detention period of 114 minutes at 0.75 MGD, 57 minutes at 1.5 MGD and 42.6 minutes at 2.0 MGD.

OF PROJECT

Each tank is equipped with a Stuart-Carter (Ball Bearing) "Walking beam" type flocculator mechanism which has inverted V-type paddles moving straight up and down. From the flocculation tanks, the water overflows a submerged weir into the settling tanks.

SETTLING TANKS

There are four settling tanks that operate in parallel. Each tank has a volume of 4,790 cubic feet. They provide a detention period of 3.82 hours at 0.75 MGD, 1.91 hours at 1.5 MGD, and 1.43 hours at 2.0 MGD. Sludge is scraped manually to a hopper fitted with an outlet mud valve at the upstream end of the tanks and is discharged through a 10 inch diameter pipe to the common plant sewer system which runs directly to the lake. At the downstream end of the tanks, water flows over four submerged weirs into a common header flume and thence to the surface of the sand filters.

SAND FILTERS

There are four rapid sand filters. Each has a surface of 144 square feet providing a total surface area of 576 square feet. The filtration rate at 1.5 MGD is equal to 2.16 US GPM/sq. ft. and at 2.0 MGD is equal to 2.9 USPGM/sq. ft. Each filter is equipped with rotary surface agitators.

Water for backwashing the filters is pumped from the high lift pump well by one Layne and Bowler electric drive vertical turbine pump rated at 4,165 US GPM at 40 feet T. D. H. Backwash waste discharges to the plant sewer system. Filtered water is run to a clear well.

CLEAR WELL

The clear well consist of two interconnected sections located beneath the settling tanks and filters. Including the high lift pump well, the clear well capacity is around 20,800 cubic feet. Post-chlorination is provided at the clear well.

HIGH LIFT PUMPING

Filtered water flows through a 24 inch diameter bottom outlet pipe from the clear well to the high lift pump wells. These pumps are arranged in a similar fashion to those used in the low lift well with pumps rated at the same flows (i. e. two at 1.25 MGD and one at 0.75 (MGD). The high lift pumps feed through a common header directly into the distribution system. Flow to the distribution system is also metered.

PROJECT COSTS

TOTAL CAPITAL COST: $1,010,714.26

The total cost to the municipality during 1964 was as follows:

Net Operating	$	36,978.65
Debt Retirement		14,122.00
Reserve		7,267.01
Interest Charged		43,204.09
TOTAL	$	101,571.75

RESERVE ACCOUNT

Balance at January 1, 1964	$	5,634.00
Deposited by Municipality		7,267.01
Interest Earned		477,89
	$	13,378.90
Less Expenditures		801.43
Balance at December 31, 1964	$	12,577.47

LONG TERM DEBT: The municipality's long term debt to the OWRC, revised December 31, 1964 was $688,056.60.

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	2397.49	1533.82			515.10		65.91	19.75		262.91
FEB	2090.48	1398.96			502.03		50.09	58.69	56.70	24.01
MARCH	2419.12	1393.10			472.85	303.75	79.24	14.28	28.89	127.01
APRIL	2826.02	1415.97			466.05	559.18	36.02	321.44		27.36
MAY	8526.24	2331.75			429.74		15.19	25.69	127.68	5596.19
JUNE	2485.94	1904.63			430.08		129.12			22.11
JULY	2863.61	1569.09			456.22	558.68	55.91	42.87	25.59	155.25
AUG	2528.52	1570.74	213.06		450.79		15.74	8.57		269.62
SEPT	2261.13	1570.74	81.20		357.70	163.75	25.69			62.05
OCT	2283.23	1585.54			339.88		6.17	16.66		334.98
NOV	3231.03	1598.14			422.28		110.02		11.99	1088.60
DEC	3065.84	2408.72	11.60		467.58	(525.00)	262.73		377.43	62.78
TOTAL	36978.65	20281.20	305.86		5310.30	1060.36	851.83	507.95	628.28	8037.87

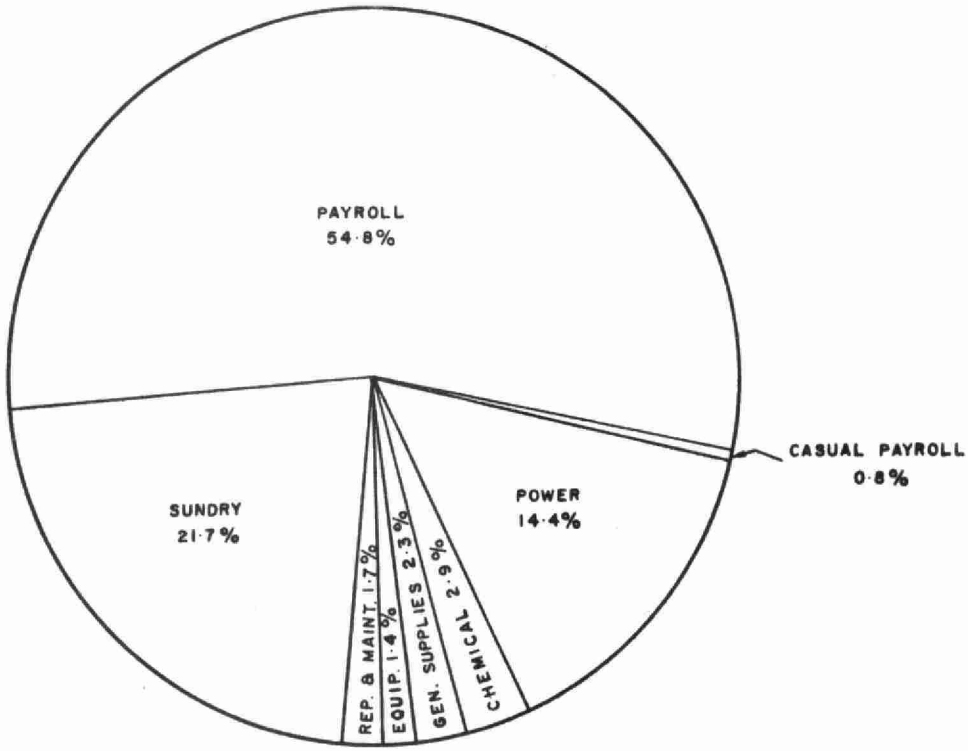
BRACKETS INDICATE CREDIT

YEARLY COSTS

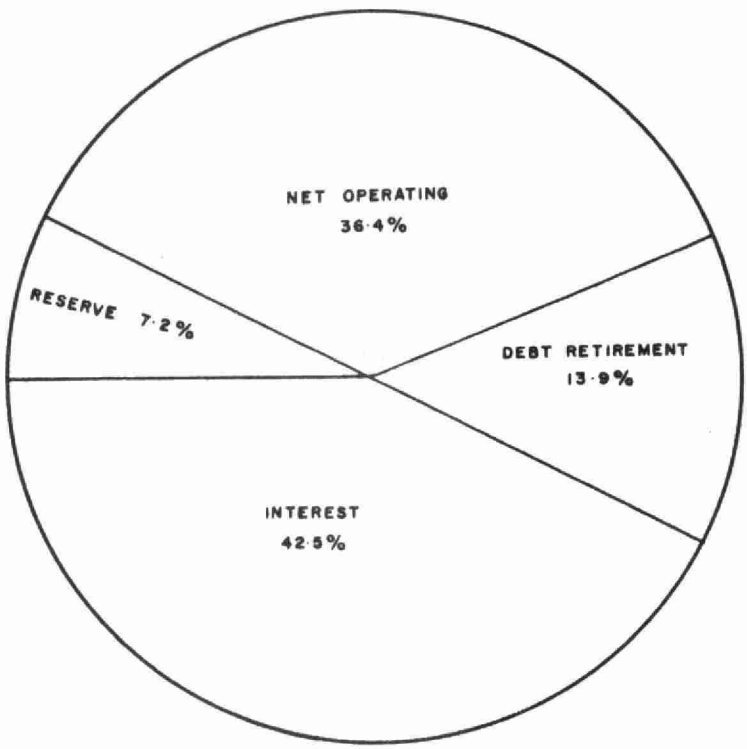
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS
1963	305.271	$30,397	$17.82	$0.10
1964	293,962	$36,979	$21.64	$0.13

BASED ON POPULATION OF 6,657
AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS

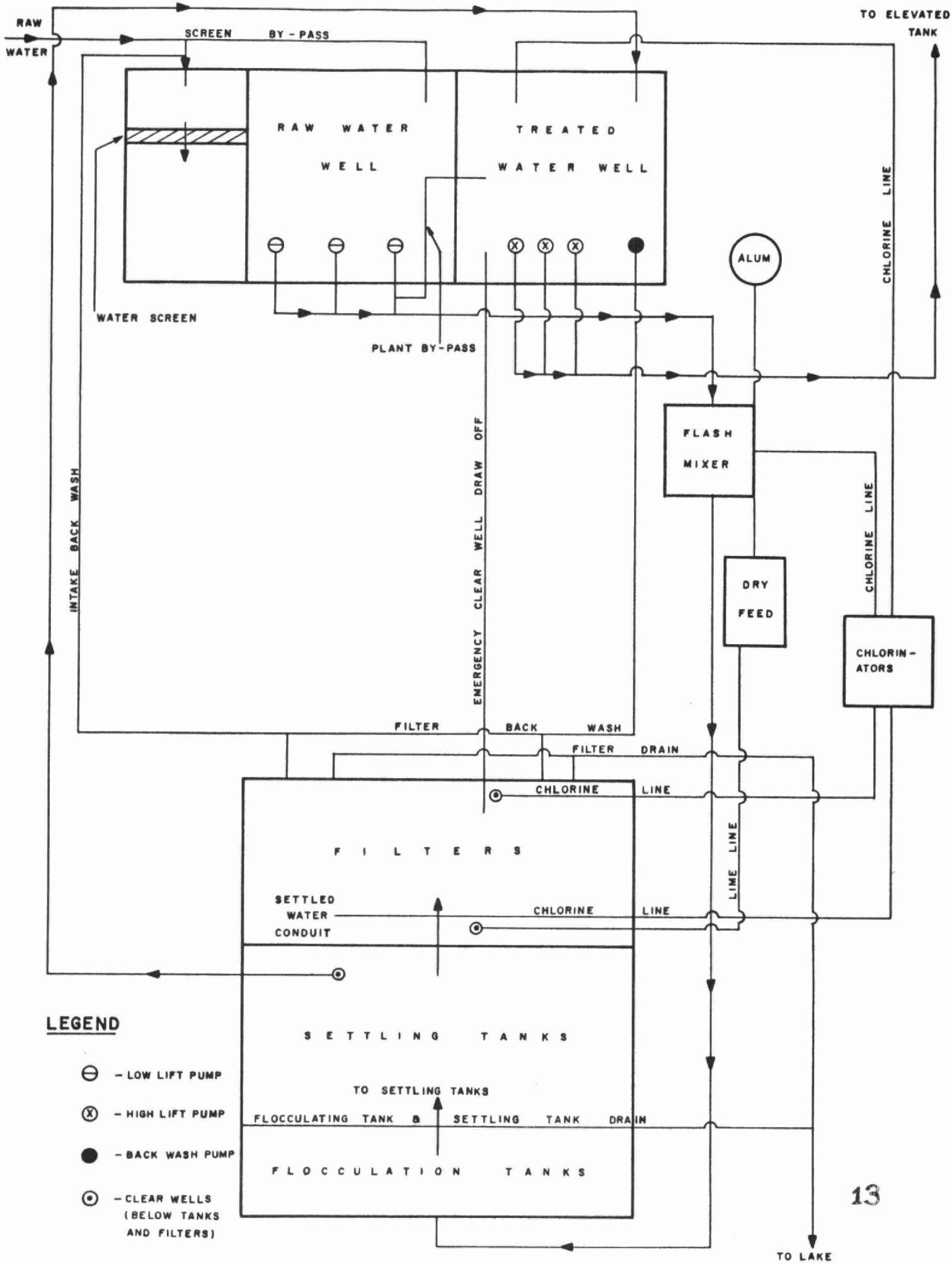


TOTAL ANNUAL COST



Technical Section

FLOW CHART


RAW WATER
SCREEN
BY - PASS
TO ELEVATED TANK
RAW WATER WELL
TREATED WATER WELL
ALUM
CHLORINE LINE
WATER SCREEN
PLANT BY-PASS
FLASH MIXER
INTAKE BACK WASH
EMERGENCY CLEAR WELL DRAW OFF
DRY FEED
CHLORINE LINE
CHLORIN-ATORS
FILTER BACK WASH
FILTER DRAIN
CHLORINE LINE
F I L T E R S
LIME LINE
SETTLED WATER CONDUIT
CHLORINE LINE
S E T T L I N G T A N K S
TO SETTLING TANKS
FLOCCULATING TANK & SETTLING TANK DRAIN
F L O C C U L A T I O N T A N K S
TO LAKE
LEGEND
- LOW LIFT PUMP
- HIGH LIFT PUMP
- BACK WASH PUMP
- CLEAR WELLS (BELOW TANKS AND FILTERS)

Design–Data

GENERAL

Type of Plant - Rapid sand filter

Design Capacity - 1.5 MGD
2.0 MGD for short periods of time

Source of Water - Lake Huron

INTAKE

One rock filled timber crib with cover plate and 1606 feet of 30 inch diameter main.

SCREENING

One Link-Belt Model No. 45A Thruflow travelling water screen with clear openings of 3/8 inch. The screen is three feet wide and 23 feet deep. Travelling speed is 10 feet per minute. Control will be manual normally. However, it will start automatically with a 2 inch differential. An alarm will ring at a 4 inch differential.

LOW LIFT PUMPING

Two low lift pumps rated at 1.25 MGD and 0.75 MGD at 28 feet T. D. H. in one low lift raw water well. One low lift pump rated at 1.25 MGD at 28 feet T. D. H. in the adjacent raw water well.

FLASH MIXER

Tank dimensions are 7.67 feet square by 8.5 feet deep. Mixer is a Link-Belt No. 30 which is equipped with a 30 inch propellor at a maximum speed of 125 RPM and is powered by a 3 HP Tamper squirrel cage induction motor.

FLOCCULATING TANKS

Two flocculating tanks, each 20.5 feet wide, 14.5 feet long by 15.25 feet average water depth. Walking beam V-type paddles are used. Paddles are constructed of 2 inch by 6 inch cypress wood.

SETTLING TANKS

Four settling tanks, each 61.5 feet long 10.25 feet wide by 7.6 feet deep. Sludge is scraped manually to a hopper fitted with an outlet mud valve at the upstream end of the tanks. Sludge is discharged through a 10 inch diameter pipe to the common plant sewer system which runs directly to the lake.

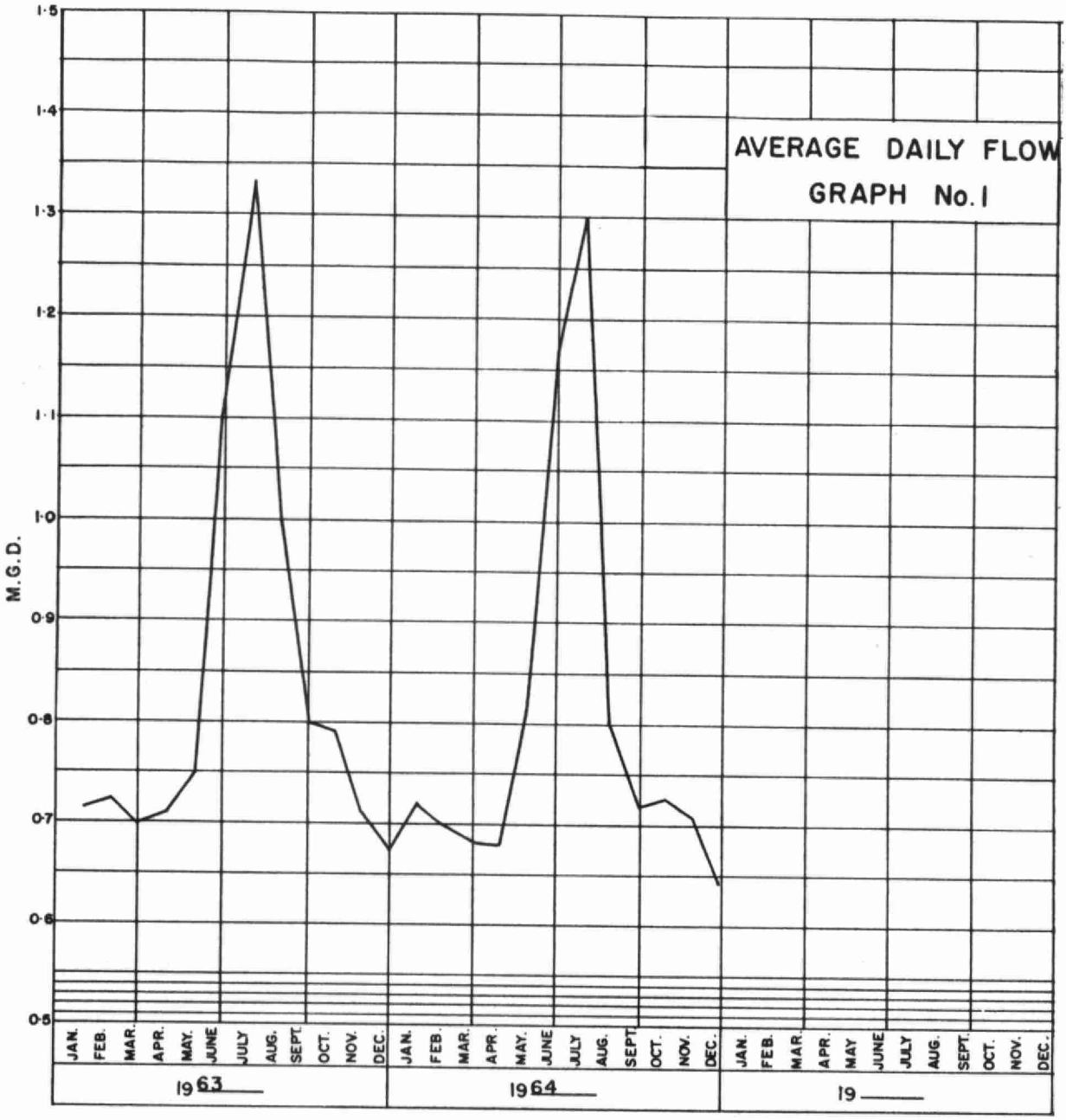
HIGH LIFT PUMPING

High lift pumps are arranged similarly to the low lift pumps. Two pumps rated at 1.25 MGD and one at 0.75 MGD at 28 feet T. D. H.

LAYER DESCRIPTIONS	THICKNESS (inches)	PARTICLE SIZE LIMITS
Sand (top)	24	0.5 to 0.55 MM
Gravel (6th)	5	2" to 1"
Gravel (5th)	2	1" to 1/2"
Gravel (4th)	2	1/2" to 1/4"
Gravel (3rd)	4	1/4" to 1/8"
Gravel (2nd)	2	1/2" to 1/4"
Gravel (bottom)	2	1" to 1/2"

SAND FILTERS

Four units each with surface dimensions of 12 feet by 12 feet. Filter media is arranged according to the above table. The design filtration rate at 1/5 MGD is 2.16 USGPM/square foot. Each filter is supplied with a 4 foot, 11 inch Palmer sweep filter agitator. Filters are of the rapid sand type.



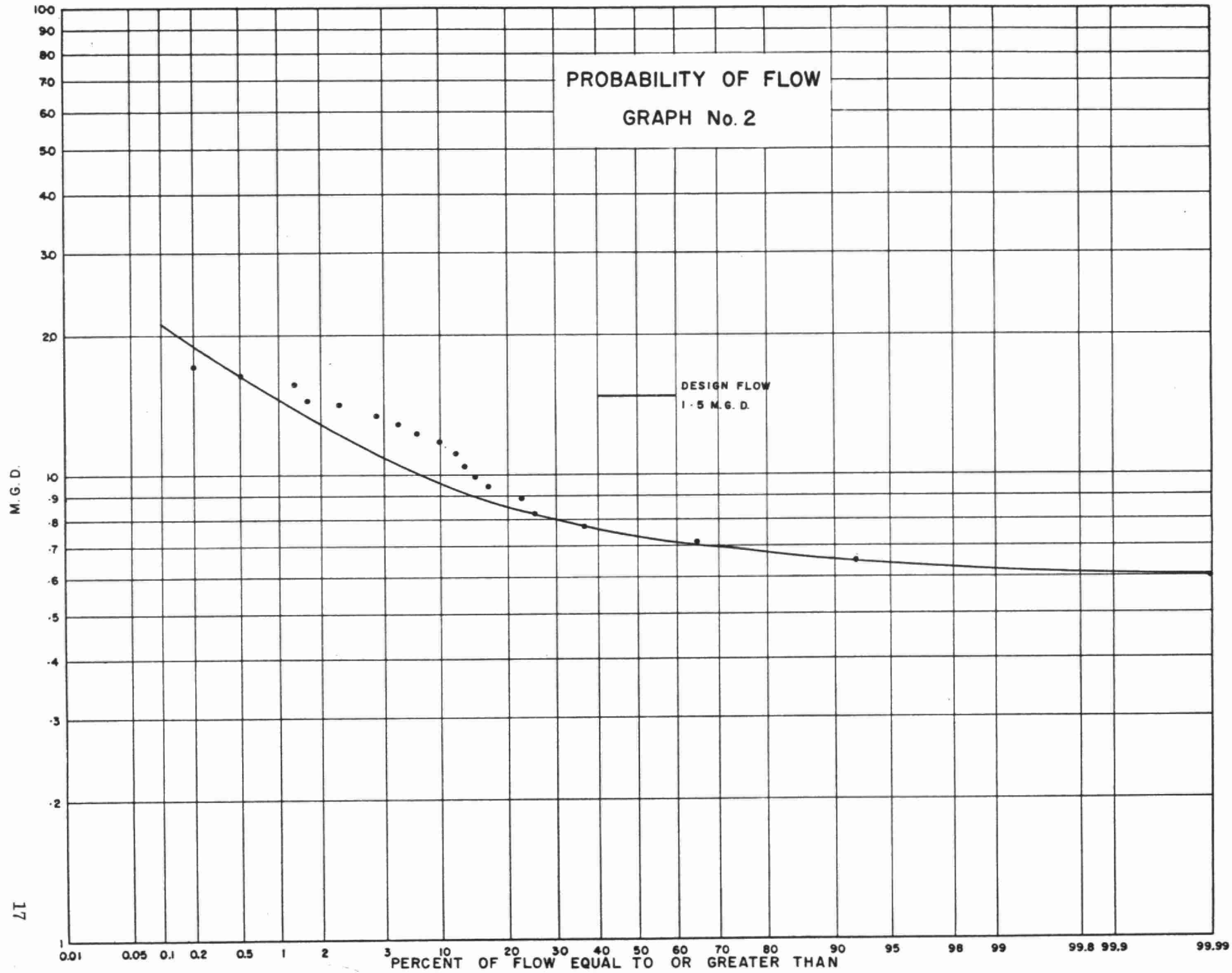
Process Data

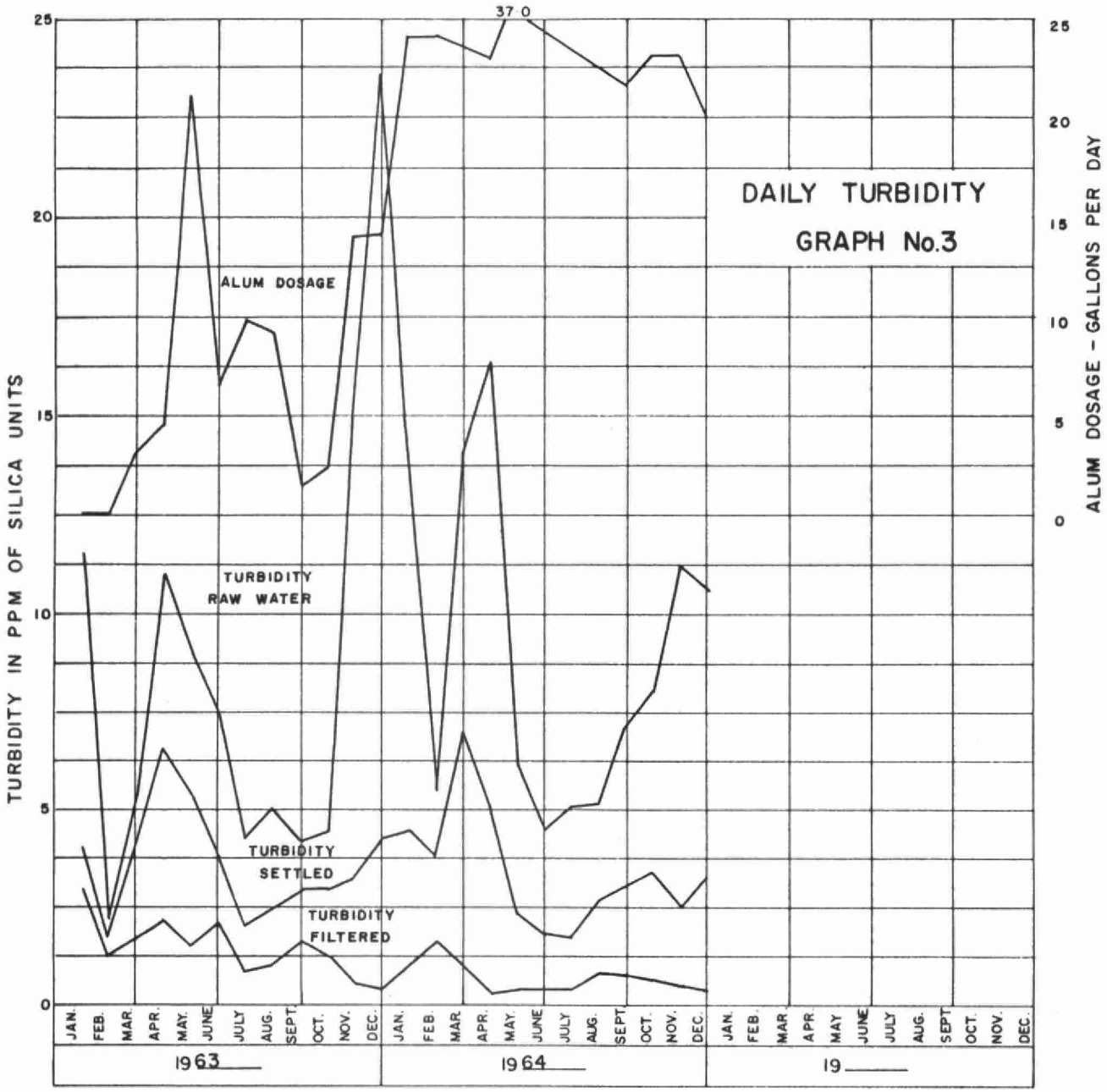
The average daily demand plotted on a monthly basis is shown on Graph No. 1. Graph No. 1 is continuous from February 1963 to December 1964. It is interesting to note that during the summer months the demand was approximately double the demand during the months in the remainder of the year. Although lawn watering restrictions were in force during the summer of 1964, lawn watering was probably the dominant factor responsible for the large increase in demand during the summer months.

The maximum average daily demand on a monthly basis occurred in July and the minimum occurred in December with demands of 1.30 million gallons per day and 0.64 million gallons per day respectively.

From Graph No. 2, it may be seen that the design capacity of 1.5 million gallons per day was exceeded one percent of the time during the year.

The average daily demand for 1964 was 0.805 million gallons.

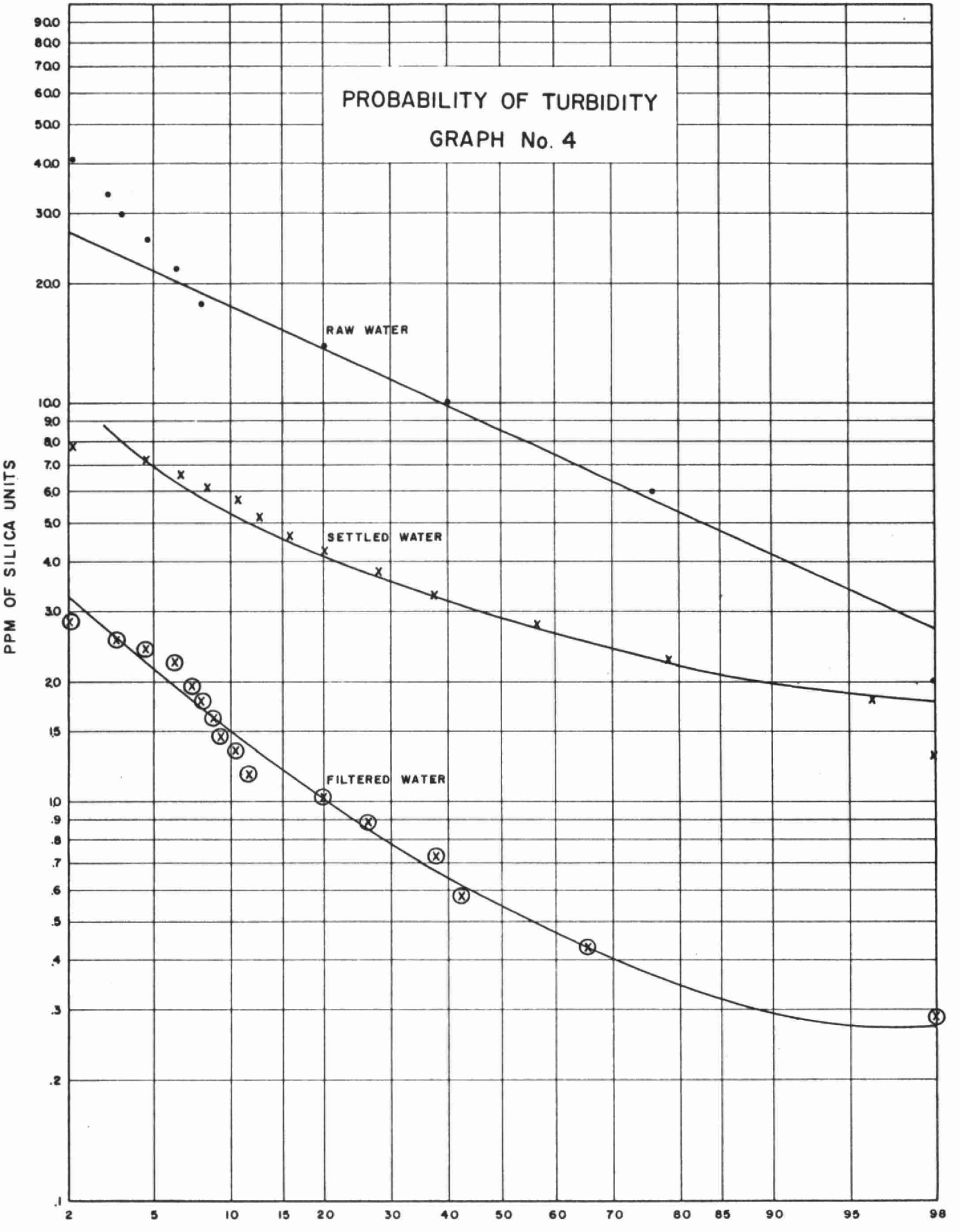

PROBABILITY OF FLOW
GRAPH No. 2
DESIGN FLOW
1·5 M.G.D.
M.G.D.
100
90
80
70
60
50
40
30
20
10
·9
·8
·7
·6
·5
·4
·3
·2
1
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF FLOW EQUAL TO OR GREATER THAN



The daily turbidities averaged on a monthly basis for the raw water, settled water and treated water may be seen on Graph No. 3 for a period extending from February 1963 to December 1964. On an average the Lake Huron raw water was more turbid at Goderich during 1964 than during 1963. This is further illustrated on Graph No. 4, where it may be seen that the raw water on a daily basis exceeded 7.0 ppm of silica units 65 percent of the time while during 1963, the raw water exceeded 7.0 ppm of silica units 44 percent of the time. As a result alum was used to increase the efficiency of the settling process more often and in greater quantities in 1964 compared to 1963. This may be seen on observing Graph No. 3 which, in addition to displaying turbidity, shows the daily alum dosage averaged on a monthly basis plotted for the same period as the turbidity units.

The general practice is to add alum to the raw water whenever the raw water turbidity exceeds 7.0 ppm of silica units. There has never been an alkalinity deficit in the water to prevent a proper reaction with alum. As a result lime has not been required to increase the alkalinity.

Throughout the year the filtered water turbidity was below the maximum of 5 ppm of silica units recommended by the U.S. Public Health Standards for treated water.


PROBABILITY OF TURBIDITY
GRAPH No. 4
RAW WATER
SETTLED WATER
FILTERED WATER
PPM OF SILICA UNITS
PERCENT EQUAL TO OR GREATER THAN
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98

PRE - CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	22.189	171.5	0.77
FEBRUARY	20.229	159.1	0.79
MARCH	21.097	221.7	1.05
APRIL	20.359	218.0	1.07
MAY	25.188	205.1	0.81
JUNE	35.131	276.5	0.79
JULY	40.212	310.8	0.77
AUGUST	24.692	251.3	1.02
SEPTEMBER	21.446	197.8	0.92
OCTOBER	22.375	177.3	0.79
NOVEMBER	21.129	178.6	0.84
DECEMBER	19.915	165.4	0.83
TOTAL	293.962	2533.1	-
AVERAGE	24.497	211.1	0.86

COMMENTS

Chlorine is added to the raw water in the flash mixer. During 1964 it was found that an average chlorine dosage of 0.86 ppm was required to maintain a pre-chlorine residual of 0.2 ppm in the raw water.

POST - CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	22.189	32.0	0.14
FEBRUARY	20.229	32.0	0.16
MARCH	21.097	55.4	0.26
APRIL	20.359	38.4	0.19
MAY	25.188	29.1	0.12
JUNE	35.131	37.9	0.11
JULY	40.212	57.7	0.14
AUGUST	24.692	67.9	0.27
SEPTEMBER	21.446	77.9	0.36
OCTOBER	22.375	75.9	0.34
NOVEMBER	21.129	67.2	0.32
DECEMBER	19.915	63.9	0.32
TOTAL	293.962	635.3	-
AVERAGE	24.497	52.9	0.22

COMMENTS

Chlorine is added to the filtered water in the treated water well. During 1964, it was found that an average chlorine dosage of 0.22 ppm was required to maintain a post-chlorine residual of 0.3 ppm. The dosage was less than the residual because most of the chlorine demand was satisfied during pre-chlorination.

CONCLUSIONS

The treated water quality was excellent throughout the year and met OWRC standards at all times. Difficulties were not encountered during the year in supplying an adequate volume of treated water to the distribution system. Due to excellent operation of the plant minimal operating difficulties were encountered.


ONTARIO WATER RESOURCES COMMISSION